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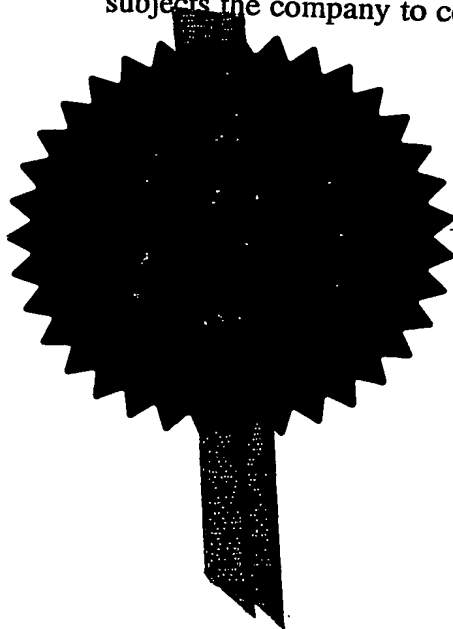
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Newport
South Wales
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Stephen Hordley

Signed

Dated 24 February 2005

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Cardiff Road
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Request for grant of a patent

(See the notes on the back of this form. You can also get an explanatory leaflet, from the Patent Office to help you fill in this form)

1. Your reference DAW1300
2. Patent application number (The Patent Office will fill in this part) 24 APR 2004 0409149.2

3. Full name, address and postcode of the or of each applicant (underline all surnames)

IMI Vision Limited
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26APR04 EB91117-12 002806
P01/7700 0.00-0409149.2 CHEQUE

08385171064

Patents ADP number (if you know it)

If the applicant is a corporate body, give the country/state of its incorporation

England

4. Title of the invention FLUID METERING

5. Name of your agent (if you have one)

Barker Brettell

"Address for service" in the United Kingdom to which all correspondence should be sent (including the postcode)

138 Hagley Road
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Birmingham
B16 9PW

Patents ADP number (if you know it)

7442494002 ✓

6. If you are declaring priority from one or more earlier patent applications, give the country and the date of filing of the or of each of these earlier applications and (if you know it) the or each application number	Country	Priority application number (if you know it)	Date of Filing (day/month/year)

7. If this application is divided or otherwise derived from an earlier UK application, give the number and the filing date of the earlier application	Number of earlier application	Date of filing (day/month/year)

8. Is a statement of inventorship and of right to grant of a patent required in support of this request (Answer 'Yes' if:
a) any applicant named in part 3 is not an inventor, or
b) there is an inventor who is not named as an applicant, or
c) any named applicant is a corporate body.
See note (d))

Yes

Patents Form 1/77

9. Enter the number of sheets for any of the following items you are filing with this form. Do not count copies of the same document.
- Continuation sheets of this form -

Description 6 + 6

Claim(s) -

Abstract -

Drawing(s) 1 + 1

10. If you are also filing any of the following, state how many against each item.

Priority documents -

Translations of priority documents -

Statement of inventorship and right to grant of a patent (*Patents Form 7/77*) -

Request for preliminary examination -
(*Patents Form 9/77*)

Request for substantive examination -
(*Patents Form 10/77*)

Any other documents -
(*please specify*)

11. I/We request the grant of a patent on the basis of this application.

Signature

Barker Brettell

Date

Barker Brettell

23 April 2004

12. Name and daytime telephone number of person to contact in the United Kingdom

David A. Wightman

Tel: 0121 456 1364

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FLUID METERING

This invention relates to fluid metering and more especially relates to improvements to and/or modifications of the invention described in our co-pending UK patent application No 0401198.7 dated 21 January 2004, the whole disclosure of which is incorporated herein by way of reference thereto.

That application describes a disposable pump unit for receiving and metering a predetermined volume of fluid, for example a viscous beverage concentrate such as orange juice concentrate, the pump comprising a body having a surface at which opens the mouth of a cavity formed in the body, an inlet port for the fluid opening at the surface adjacent to the mouth of the cavity whereby, when the inlet port is open, fluid can flow from the inlet port into the cavity *via* the mouth thereof, a first flexible membrane sealingly secured at its periphery to the surface and overlying the cavity and the inlet port, an outlet port for the fluid, there being a fluid flow passageway extending through the body and connecting the cavity to the outlet port, and a second flexible membrane sealingly secured at its periphery and overlying the outlet port, those portions of the first and second flexible membranes, where they overlie the inlet and outlet ports respectively, serving as closures for the ports. In use, the disposable pump unit is detachably coupled to a re-usable pump actuator, with the said surface of the body sealingly abutting the pump actuator, comprising a source of positive and negative pressure actuating fluid, preferably air, and first and second valve actuating means associated respectively with the inlet port closure and the outlet port closure, the arrangement being such that, when the external surface of the first flexible membrane (which acts as a pumping membrane) is exposed to the source of negative fluid pressure, with the inlet port open and the outlet port closed, it is drawn away from the disposable pump body whereby the fluid to be metered is

drawn from a reservoir thereof, *via* the inlet port into substantially all of the space defined by the cavity and the first flexible membrane ("the fluid filling step"). Then, with the inlet port closed and the outlet port open, when positive pressure fluid, e.g. compressed air, is applied to the external surface of the first flexible membrane, the first flexible membrane is urged back towards and into the cavity and thus pumps the fluid from the cavity through the said passageway to the outlet port ("the fluid metering step"). The fluid filling step and the fluid metering step are alternately repeated as desired. In a preferred embodiment of the disposable pump unit, the outlet port also opens at the aforesaid surface of the body, in which case the first and second flexible membranes may be integral with one another. The membranes preferably comprise flexible and durable film or sheet polymer, for example low density polyethylene (LDPE).

The combination of the disposable pump unit and the re-usable pump actuator may constitute a beverage dispenser. For example, the disposable pump unit may serve to meter a beverage concentrate which is then mixed with water, preferably in a predetermined ratio, delivered by the dispenser. For that purpose, the body of the disposable pump unit may incorporate a water inlet arranged such that, after the concentrate has passed through the outlet port, it mixes with the water and is then dispensed into a receptacle such as a cup or glass. Mixing may be facilitated by some form of static mixer or turbulator.

The disposable pump unit is preferably permanently connected to, or is integral with, a reservoir containing the fluid to be metered so that, once the reservoir is empty or otherwise needs to be changed, the combined reservoir and pump unit are disconnected from the pump actuator and may be disposed of. A replacement reservoir/pump unit may then be coupled to the pump actuator.

- The disposable pump unit described in our above patent application has the advantage that it is relatively inexpensive to produce in large volumes and that, because the metered fluid comes into contact with only
- 5 components of the disposable pump unit, the pump actuator may be continually re-used without the need to clean and sanitise the machine regularly, in contrast to, for example, most existing post-mix drinks dispense machines.
- 10 Whilst the invention, and the specific embodiments thereof, described in our above patent application function adequately, we have devised certain improvements/modifications as will now be more particularly defined and described.
- 15 According to a first aspect of the present invention, in a disposable pump unit as defined in our above patent application, the fluid flow passageway extending through the body and connecting the cavity to the outlet port terminates at one end at a generally concave wall defining the cavity, the wall having formed therein a plurality of passageways that communicate
- 20 with the fluid flow passageway thereby to inhibit, during the fluid metering step, the formation of occluded regions of fluid between the cavity wall and the first flexible membrane and thus ensure that substantially all of the fluid drawn from the reservoir thereof during the fluid filling step is pumped out during the fluid metering step. Each of the
- 25 plurality of passageways is preferably a groove.
- According to a second aspect of the present invention, at least the first flexible membrane, i.e. the membrane that overlies the cavity and the inlet port formed in the body, is substantially non-stretchable and is
- 30 dimensioned such that, during the fluid metering step, it can be urged by the actuating fluid into contact with substantially the whole surface of the

cavity wall whereby substantially all of the fluid drawn from the reservoir during the fluid filling step is pumped out during the fluid metering step.

To that end, the first flexible membrane (and the second flexible membrane where the two are integral with one another) may, for example, comprise polyamide film material. In a preferred embodiment, at least the first flexible membrane comprises a flexible film or sheet of an integrated laminate comprising a non-stretchable polymer, for example a polyamide, and an underlying heat-weldable polymer, for example a food-grade polyethylene, the latter having been heat-welded to the body so as to be sealingly secured thereto as aforesaid with the body comprising a moulding in a compatible food-grade polymer, for example a polyethylene. An example of a suitable laminate is S77 available from Amcor Flexibles Baricol.

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According to a third aspect of the present invention, the second valve actuating means associated with the outlet port closure is capable of effecting a variable, preselected, degree of opening of the outlet port.

This may be achieved by using, for example, a stepper motor or a variable end stop solenoid associated with an armature or other actuator that acts upon the second flexible membrane where it overlies the outlet port. This feature enables the disposable pump unit to control the outlet flow rate as desired depending upon the viscosity of the fluid being metered. For example, with a relatively higher viscosity fluid, it may be desirable to have the outlet fully open in order to achieve the desired outlet flow rate and hence the required ratiometric mixing control with a diluent such as water, whereas with a relatively lower viscosity fluid it may be desirable to have the outlet only partially open for that purpose.

30

According to a fourth aspect of the present invention, identification means are provided for identifying one or more characteristics of the fluid to be metered and the re-usable pump actuator includes reading means for automatically reading the identification means whereby the combined
5 pump/pump actuator, for example a drinks dispense machine, may adapt its dispense mode, e.g. diluent flow rate, and/or provide audio and/or visual information to the user in dependence upon the characteristics identified.

10 It will be appreciated that where the pump is part of a dispensing apparatus the identification means and reading means may be placed elsewhere besides on the disposable pump and non disposable pump actuator, for example the means of identification may be placed on the reservoir of pumped fluid and the reading means placed in proximation
15 thereto.

Such characteristics may include, for example, one or more of the viscosity of the fluid to be metered in a particular case, its type (e.g. orange juice or otherwise), its shelf-life/expiry date and the desired
20 dilution ratio. The identification means and the reading means may be based on, for example, radio frequency identification (RDIF) technology, bar code technology or colour-sensing technology, the general nature of all of which are known.

25 According to a fifth aspect of the invention, there is provided a disposable pump unit as defined in our above-mentioned patent application for mixing two or more fluids, especially viscous fluids, the body defining two or more said cavities and an inlet port associated with each cavity and with reservoirs for the respective fluids, and a common outlet associated
30 with the cavities, whereby the fluids may, in association with a re-usable pump actuator, be dispensed simultaneously and mixed.

Such a unit has a number of diverse applications, and we mention by way of example the mixing of the two precursor materials of epoxy resins (e.g. "Araldite" - Registered Trade Mark).

5

Certain aspects of the present invention will now be described, by way of example only, with reference to the accompanying drawings in which:

Figure 1 is a perspective view of the rigid part of a pump unit in accordance with the invention showing the grooves to eliminate occluded areas of pumped fluid.

10

Referring to Figure 1, a rigid plastic pump unit is shown consisting of an inlet 1 leading to two chamber inlets 2 from which there is a flowpath to the volumetric chamber 3 and its associated outlet 4. Provided in surface of the volumetric chamber 3 are recessed grooves 5 which, should the flexible film (not shown) trap an occluded area of the pumped fluid remote from the chamber outlet 4, there will always be a channel for the fluid to be forced out of ensuring that the chamber is fully emptied every time, thus giving a repeatable volumetric output.

15
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The recessed grooves 5 may be employed in a pump unit having one, two or more chambers 3, for example a pump unit of the type described in our afore-mentioned co-pending UK patent application No 0401198.7. Where the pump unit has two or more chambers 3, the chamber inlets 2 may be connected to a common inlet 1 or to separate inlets 1. Separate inlets 1 may be employed for metering different fluids.

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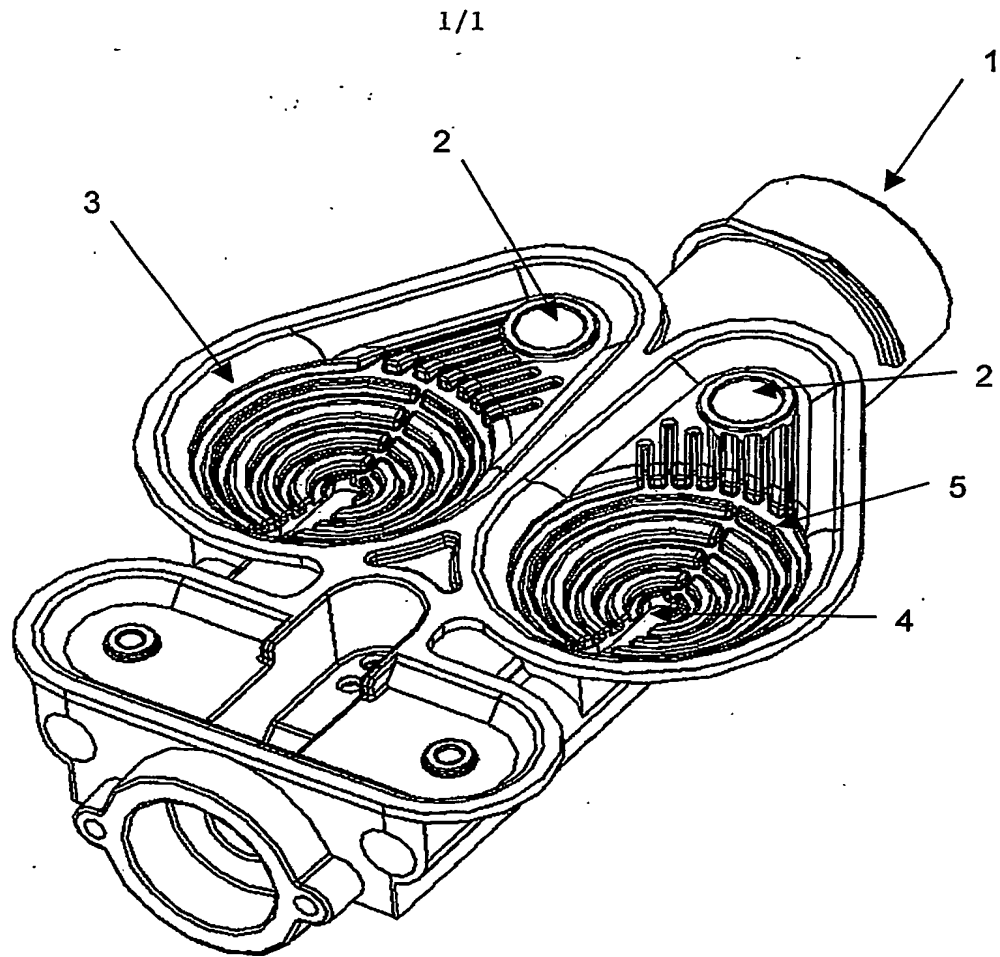


Figure 1

Document made available under the Patent Cooperation Treaty (PCT)

International application number: PCT/GB05/000201

International filing date: 21 January 2005 (21.01.2005)

Document type: Certified copy of priority document

Document details: Country/Office: GB
Number: 0409149.2
Filing date: 24 April 2004 (24.04.2004)

Date of receipt at the International Bureau: 04 March 2005 (04.03.2005)

Remark: Priority document submitted or transmitted to the International Bureau in compliance with Rule 17.1(a) or (b)



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